

LAWRENCE LIVERMORE NATIONAL LABORATORY

Lawrence Livermore National Laboratory (LLNL) is a national security laboratory with responsibility for ensuring that the nation's nuclear weapons remain safe, secure, and reliable. LLNL also applies its special expertise and multidisciplinary capabilities to prevent the spread and use of nuclear and other weapons of mass destruction and strengthen homeland security.

LLNL has pioneered the application of many technologies—from high-performance computers to advanced lasers—to meet national security needs. Today, the special capabilities developed for our stockpile stewardship and nonproliferation activities enable us to also meet enduring national needs in conventional defense, energy, environment, biosciences, and basic science. Research programs in these areas enhance the competencies needed for the Laboratory's national security mission.

With an outstanding workforce of more than 8,000 employees, the Laboratory attains its missions goals and sustains public trust in the institution through safe, secure, and efficient operations and scientific and technical excellence. LLNL is located on a one-square-mile site in Livermore, CA. A larger (10 square miles) remote explosives testing site (Site 300) is situated 18 miles to the east. LLNL is managed by the University of California (UC) for the National Nuclear Security Administration (NNSA) within the Department of Energy (DOE).

Missions

National Security is the Laboratory's defining responsibility. As one of DOE/NNSA's three national security laboratories, LLNL plays a prominent role in the Stockpile Stewardship Program and addresses the increasingly serious threat to homeland security posed by the proliferation of weapons of mass destruction (WMD). We also develop advanced technologies for other sponsors' national security work. Application of our special skills to efforts in the DOE's other mission areas—**Energy, Science, and Environment**—leads to cross-fertilization of ideas. In turn, program diversity keeps the Laboratory vital and helps to sustain the multidisciplinary base needed for our national security mission.

National Security—Stockpile Stewardship: The goal is to maintain the nuclear weapons stockpile, assure weapon safety and reliability, and certify performance without nuclear testing. LLNL is part of NNSA's integrated program of surveillance, assessment (validated by simulation and experiments), and refurbishment or replacement of weapons, as necessary. We have special responsibilities for weapons that LLNL designed (W87 and W62 ICBM warheads, B83 bomb, and W84 cruise missile warhead) and the Los Alamos-designed W80 cruise missile warhead, and we are engaged in efforts to evaluate the feasibility of a reliable replacement warhead.

National Security—Strengthening Homeland Security and Countering WMD Proliferation and Use: LLNL's expertise in nuclear weapons and extensive capabilities in physical and life sciences are applied to the challenge of WMD proliferation and terrorism. Activities address the full threat spectrum—from preventing proliferation at its source, to detecting and reversing proliferation activities, to responding to the threatened use or actual use of such weapons. LLNL works closely with end users to develop advanced technologies, systems, and operational capabilities that meet real-world needs, such as our development of advanced, portable, real-time detectors of nuclear materials and biological agents.

Energy and Environment: LLNL pursues projects aimed at significant, large-scale innovations in energy production and usage, such as our research on magnetic- and inertial-confinement-fusion energy. As a key contributor to the Yucca Mountain Project, we also serve as an effective national technical resource in the management of nuclear materials. LLNL's environmental efforts are directed at

demonstrating effective characterization and remediation technologies, advancing the science base for environmental regulation, and accurately modeling regional and global climate conditions.

Science: Activities bolster our research strengths, lead to scientific discoveries, and contribute to solving important national problems. For example, LLNL's bioscience research has advanced genomics (e.g., the Human Genome Project) and strengthens national security (bioagent detection). Research ranges from astrophysics to materials science at the nanoscale and from precisely-diagnosed experiments to terascale computer simulations.

Distinctive Competencies

A Multidisciplinary, Integrated Approach to Problem Solving: with activities ranging from fundamental science to production engineering of complex systems. **High-Energy-Density Physics and Nuclear Materials:** broad expertise in nuclear weapons, fission energy, and fusion programs, with exceptional capabilities for investigating the properties of matter at extreme conditions. **Advanced Lasers:** preeminence in laser science and technology, supporting stockpile stewardship (e.g., NIF) and many other applications. **High-Performance Scientific Computing:** the application of supercomputers to support stockpile stewardship, and contributing to major advances in climate modeling, materials science, and many other areas of physics. **Materials Science:** special capabilities for materials design, synthesis, processing, characterization, and simulation for stockpile stewardship and other applications. **Engineering Development:** from the development of advanced sensors and diagnostics for experiments to the design and construction of large complex systems such as NIF.

Key Facilities

The National Ignition Facility (NIF): a stadium-sized 192-beam laser facility currently under construction, providing a unique capability for investigating weapons physics and ignition and fusion burn. "Early Light" was achieved at NIF in FY2003, and eight laser beams are now commissioned—meeting performance requirements for component systems and supporting experimental programs. **Secure and Open Computing Facilities:** the ASC Purple machine, at 100 trillion operations per second (100 teraops), and BlueGene/L, the world's fastest supercomputer at 280 teraops, are supporting stockpile stewardship in the Terascale Simulation Facility. **The Contained Firing Facility:** a versatile hydrodynamic test facility, designed to environmentally contain explosion debris. **The Superblock:** modern facilities for special nuclear materials research and engineering testing. **The National Atmospheric Release Advisory Center (NARAC):** provides atmospheric plume predictions in time for emergency response to the release of radioactive or other hazardous materials. **The Center for Accelerator Mass Spectrometry:** the most versatile system in the world for accelerator-based measurements of isotopic abundance. **The Forensic Science Center, the Radiation Detection Center, and the Biodefense Knowledge Center:** exceptional capabilities to support national security needs in chemical, nuclear, biological, and high-explosives counterterrorism.

Laboratory Staff and Funding

The Laboratory staff consists of 6,600 full-time employees, including 2,681 scientists and engineers (1,212 with Ph.D.s) as of December 30, 2005. Part-time employees, temporary hires, students, and contract employees bring the Laboratory population to over 8,400.

Laboratory Funding

For FY 2005: Stockpile Stewardship (\$1010 M), Department of Defense (\$161 M), Nonproliferation and Intelligence (\$103 M), Homeland Security (\$97 M), Safeguards and Security (\$97 M), Environmental Restoration (\$62 M), Applied and Basic Research (\$35 M), Biosciences (\$32 M), Energy and Environment (\$30 M). TOTAL (\$1.6 B).